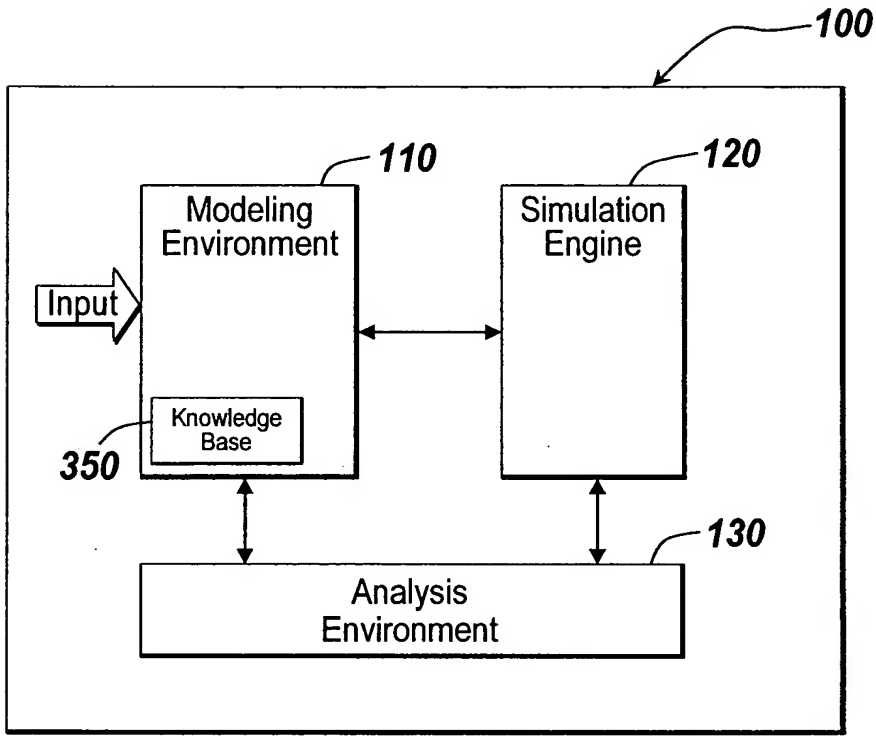
100
110
120
Modeling Environment
Simulation Engine
Input
Knowledge Base
350
130
Analysis Environment

Fig. 1

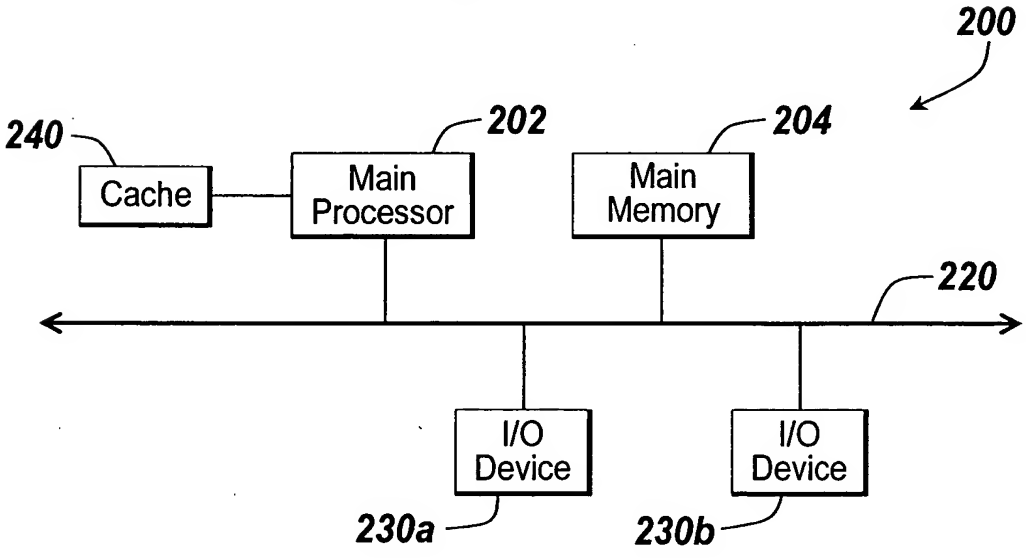
200
240
202
204
Cache
Main Processor
Main Memory
220
I/O Device
I/O Device
230a
230b

Fig. 2A

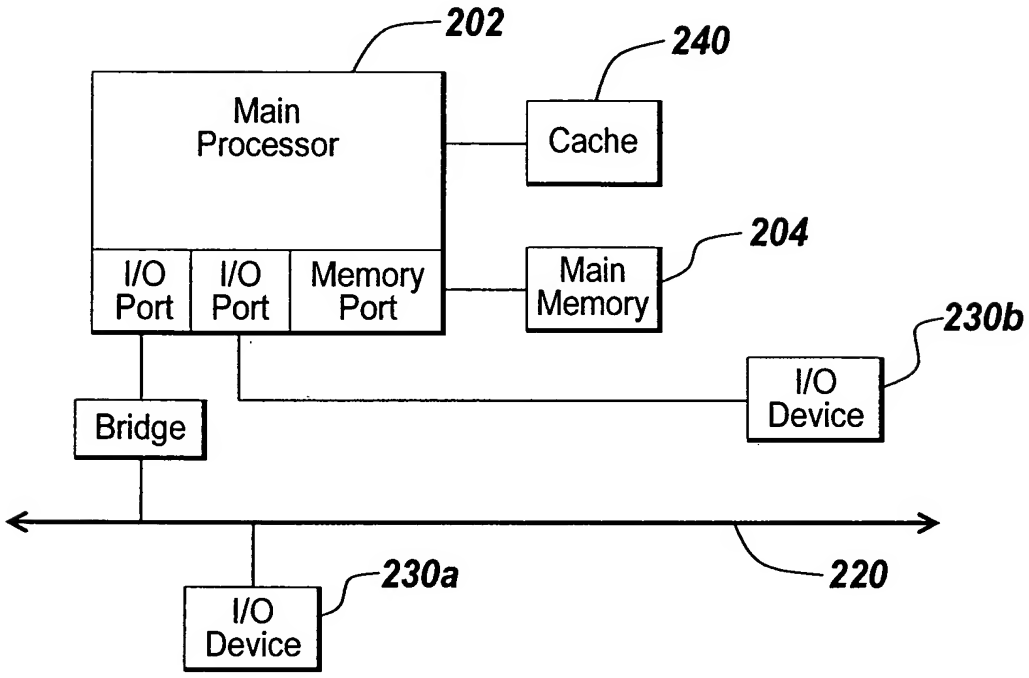
202
240
Main Processor
Cache
I/O Port
I/O Port
Memory Port
Main Memory
204
230b
I/O Device
Bridge
220
230a
I/O Device

Fig. 2B

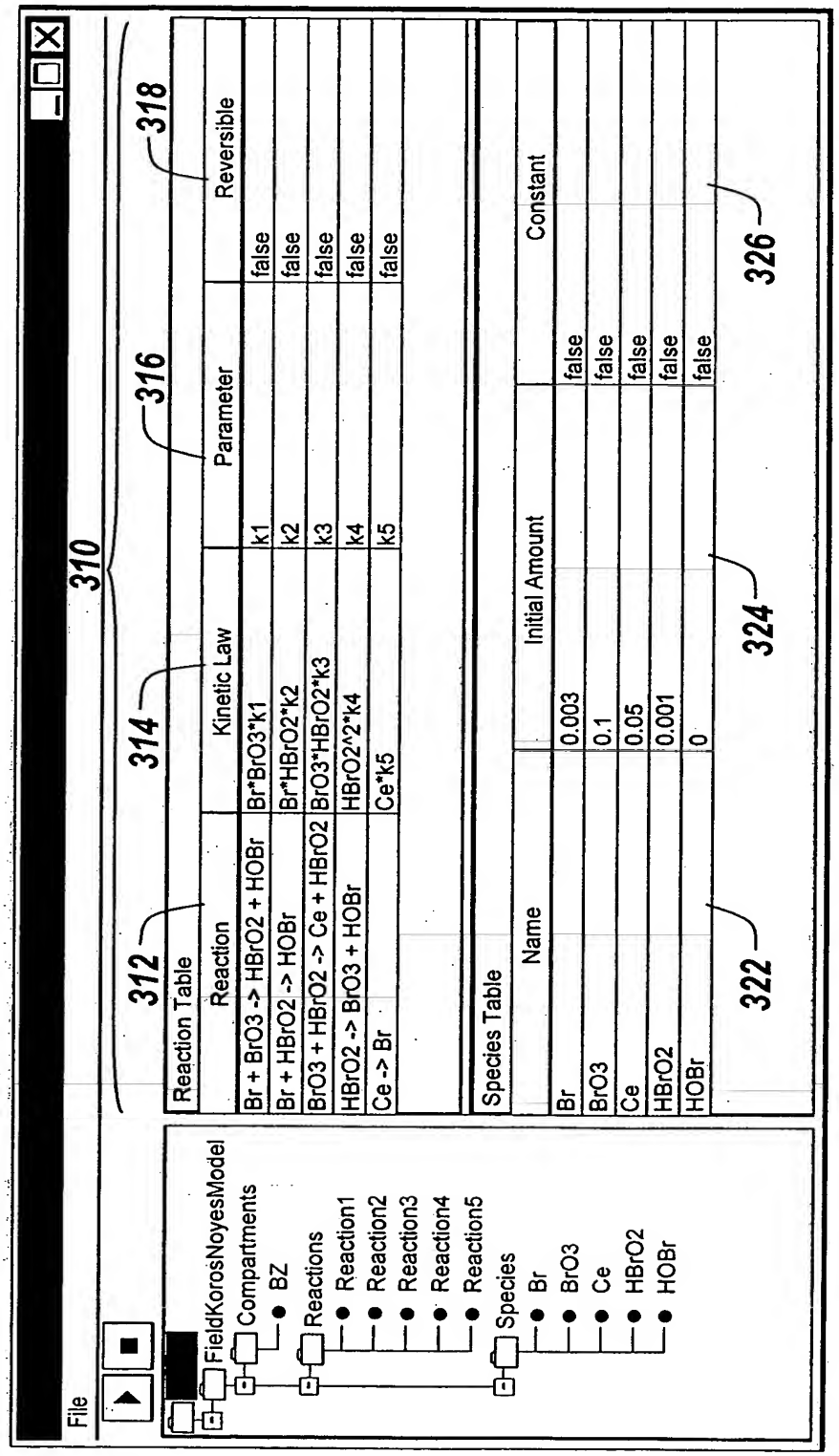
300
File
FieldKorosNoyesModel
Compartments
BZ
Reactions
Reaction1
Reaction2
Reaction3
Reaction4
Reaction5
Species
Br
BrO3
Ce
HBrO2
HOBr
302
310
312
314
316
318
320
322
324
326
Reaction Table
Reaction
Kinetic Law
Parameter
Reversible
Br + BrO3 -> HBrO2 + HOBr
Br*BrO3*k1
k1
false
Br + HBrO2 -> HOBr
Br*HBrO2*k2
k2
false
BrO3 + HBrO2 -> Ce + HBrO2
BrO3*HBrO2*k3
k3
false
HBrO2 -> BrO3 + HOBr
HBrO2^2*k4
k4
false
Ce -> Br
Ce*k5
k5
false
Species Table
Name
Initial Amount
Constant
Br
0.003
false
BrO3
0.1
false
Ce
0.05
false
HBrO2
0.001
false
HOBr
0
false

Fig. 3A

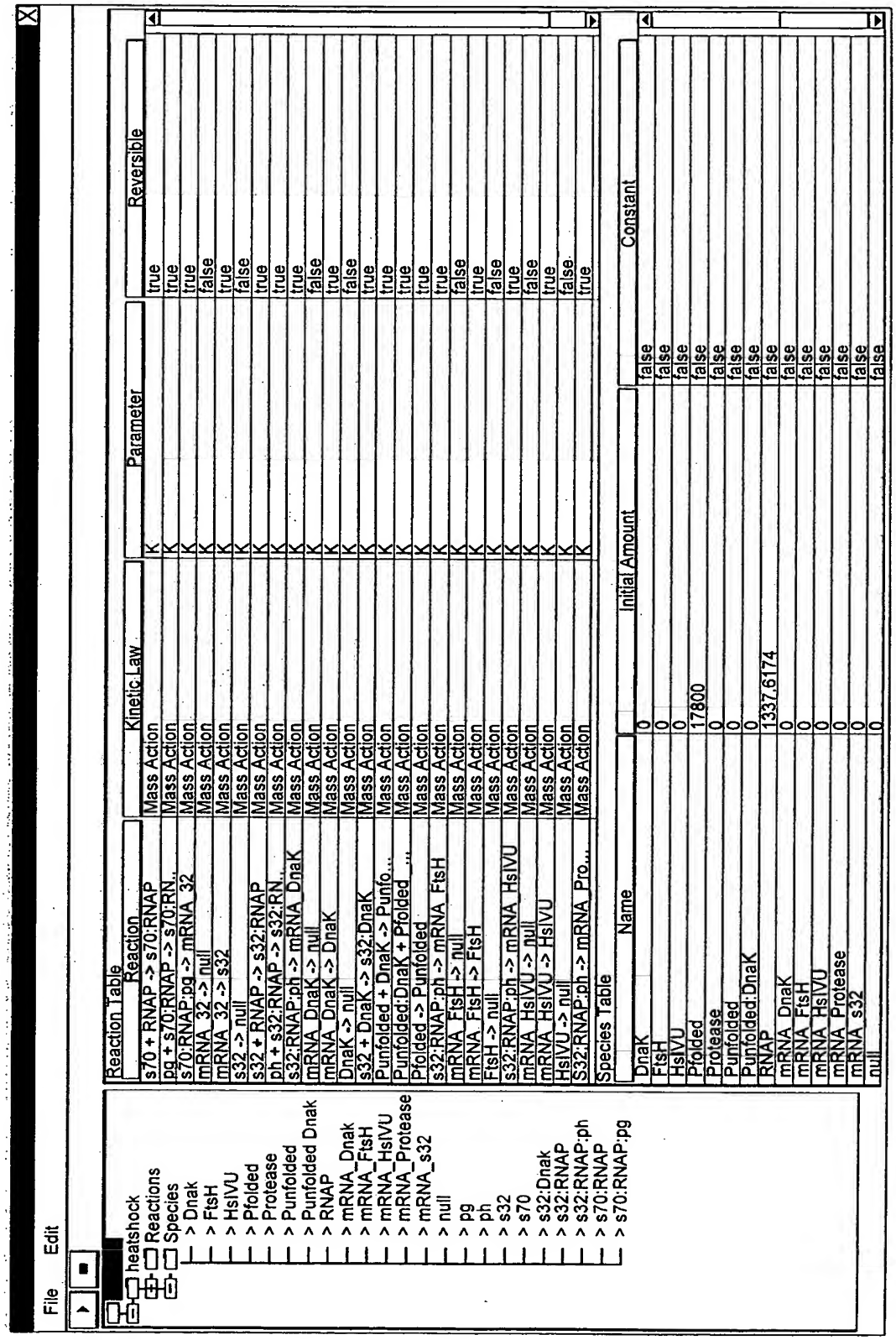
File
Edit
heatshock
Reactions
Species
> DnaK
> FtsH
> HslVU
> Pfolded
> Protease
> Punfolded
> Punfolded Dnak
> RNAP
> mRNA_Dnak
> mRNA_FtsH
> mRNA_HslVU
> mRNA_Protease
> mRNA_s32
> null
> pg
> ph
> s32
> s70
> s32:Dnak
> s32:RNAP
> s32:RNAP:ph
> s70:RNAP
> s70:RNAP:pg
Reaction Table
Reaction
Kinetic Law
Parameter
Reversible
s70 + RNAP -> s70:RNAP
Mass Action
K
true
pg + s70:RNAP -> s70:RN...
Mass Action
K
true
s70:RNAP:pg -> mRNA_32
Mass Action
K
true
mRNA_32 -> null
Mass Action
K
false
mRNA_32 -> s32
Mass Action
K
true
s32 -> null
Mass Action
K
false
s32 + RNAP -> s32:RNAP
Mass Action
K
true
ph + s32:RNAP -> s32:RN...
Mass Action
K
true
s32:RNAP:ph -> mRNA_DnaK
Mass Action
K
true
mRNA_DnaK -> null
Mass Action
K
false
mRNA_DnaK -> DnaK
Mass Action
K
true
DnaK -> null
Mass Action
K
false
s32 + DnaK -> s32:DnaK
Mass Action
K
true
Punfolded + DnaK -> Punfo...
Mass Action
K
true
Punfolded:DnaK + Pfolded ...
Mass Action
K
true
Pfolded -> Punfolded
Mass Action
K
true
s32:RNAP:ph -> mRNA_FtsH
Mass Action
K
true
mRNA_FtsH -> null
Mass Action
K
false
mRNA_FtsH -> FtsH
Mass Action
K
true
FtsH -> null
Mass Action
K
false
s32:RNAP:ph -> mRNA_HslVU
Mass Action
K
true
mRNA_HslVU -> null
Mass Action
K
false
mRNA_HslVU -> HslVU
Mass Action
K
true
HslVU -> null
Mass Action
K
false
S32:RNAP:ph -> mRNA_Pro...
Mass Action
K
true
Species Table
Name
Initial Amount
Constant
DnaK
0
false
FtsH
0
false
HslVU
0
false
Pfolded
17800
false
Protease
0
false
Punfolded
0
false
Punfolded:DnaK
0
false
RNAP
1337.6174
false
mRNA_DnaK
0
false
mRNA_FtsH
0
false
mRNA_HslVU
0
false
mRNA_Protease
0
false
mRNA_s32
0
false
null
0
false

Fig. 3B

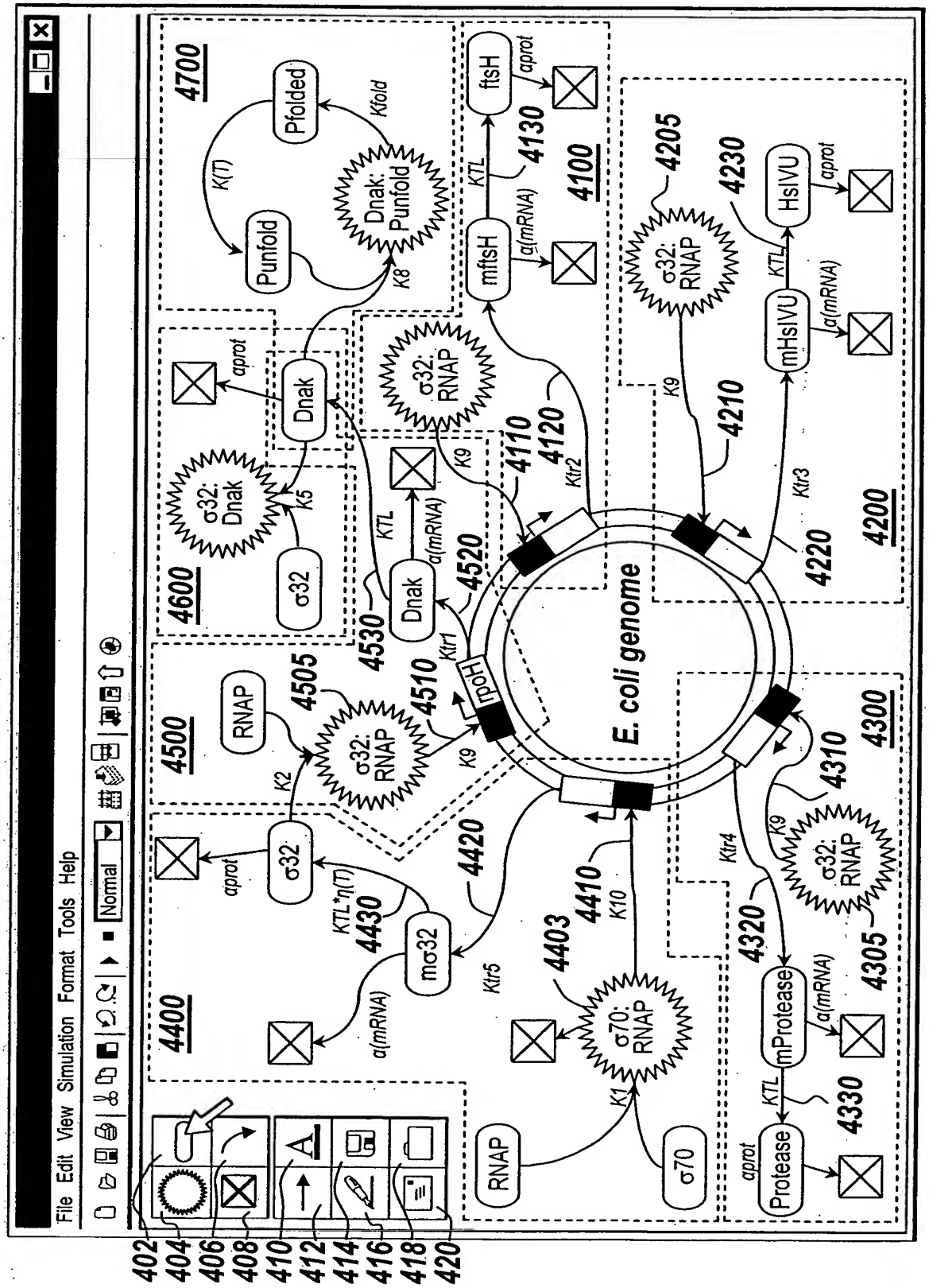
File Edit View Simulation Format Tools Help
Normal
E. coli genome
4700
Pfolded
Ktfold
K(T)
Punfold
Dnak: Punfold
K8
4600
aprot
Dnak
σ32: Dnak
K5
σ32
4530
Dnak
α(mRNA)
KTL
K9
σ32: RNAP
4110
4120
Ktr2
4100
ftsH
aprot
4130
KTL
mftsH
α(mRNA)
4205
4230
σ32: RNAP
HslVU
aprot
KTL
mHslVU
α(mRNA)
K9
4210
Ktr3
4220
4200
4500
RNAP
4505
σ32: RNAP
4510
K9
K2
rpoH
Ktr1
4520
4300
4310
K9
σ32: RNAP
4305
Ktr4
4320
mProtease
α(mRNA)
KTL
4330
Protease
aprot
4400
aprot
σ32
KTL*η(T)
4430
mσ32
α(mRNA)
4420
Ktr5
4403
4410
K10
σ70: RNAP
K1
RNAP
σ70
402
404
406
408
410
412
414
416
418
420

Fig. 4

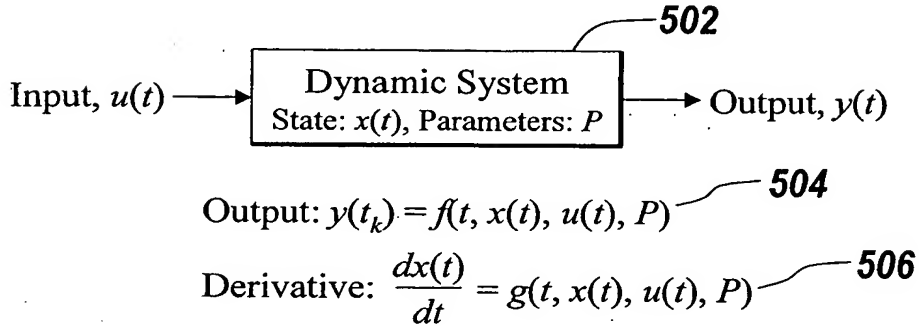

Fig. 5A

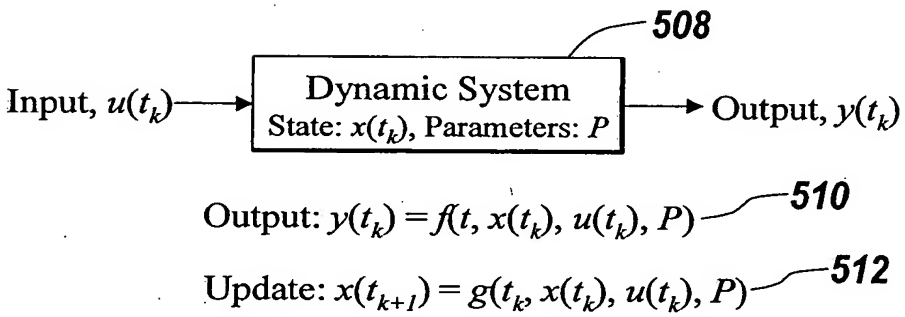

Fig. 5B

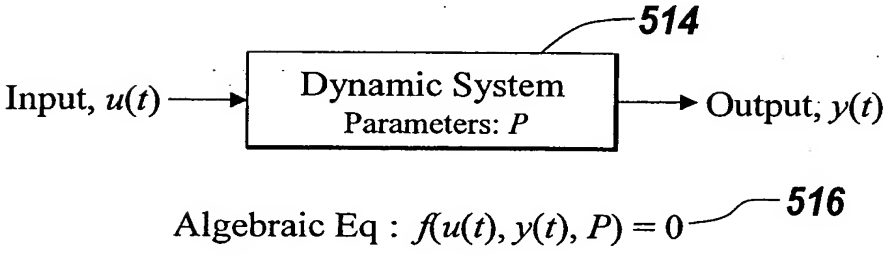

Fig. 5C

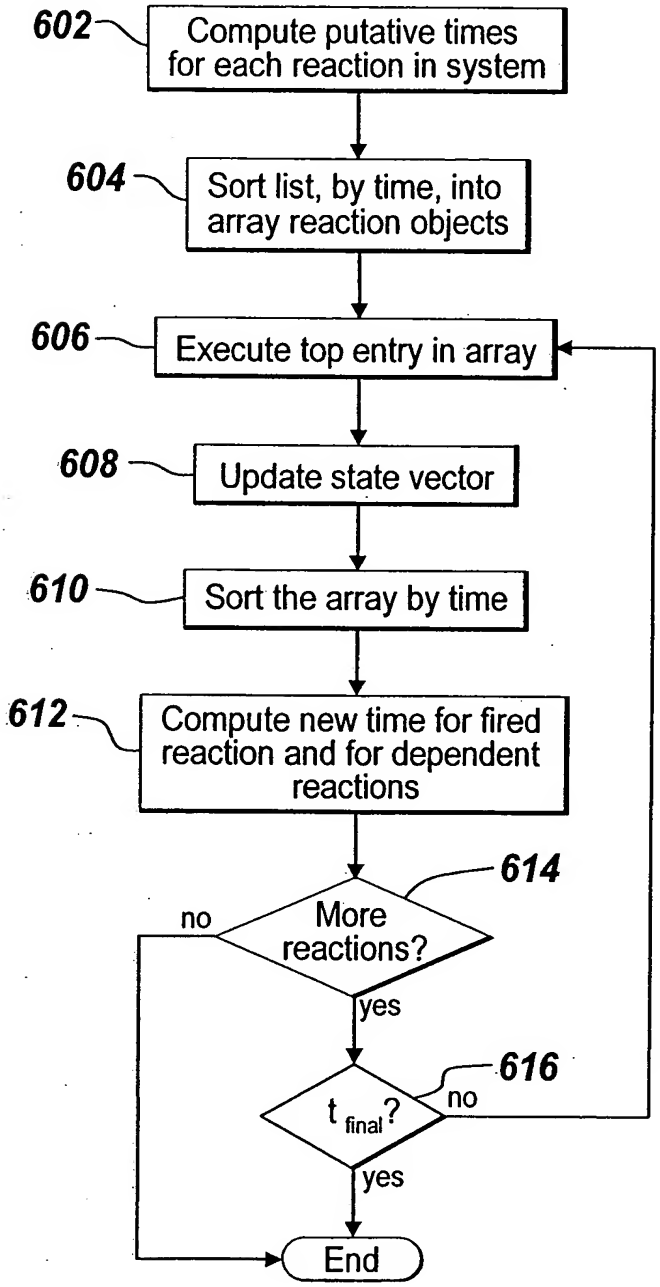
602
Compute putative times for each reaction in system
604
Sort list, by time, into array reaction objects
606
Execute top entry in array
608
Update state vector
610
Sort the array by time
612
Compute new time for fired reaction and for dependent reactions
614
More reactions?
no
yes
616
t_{final}?
no
yes
End

Fig. 6

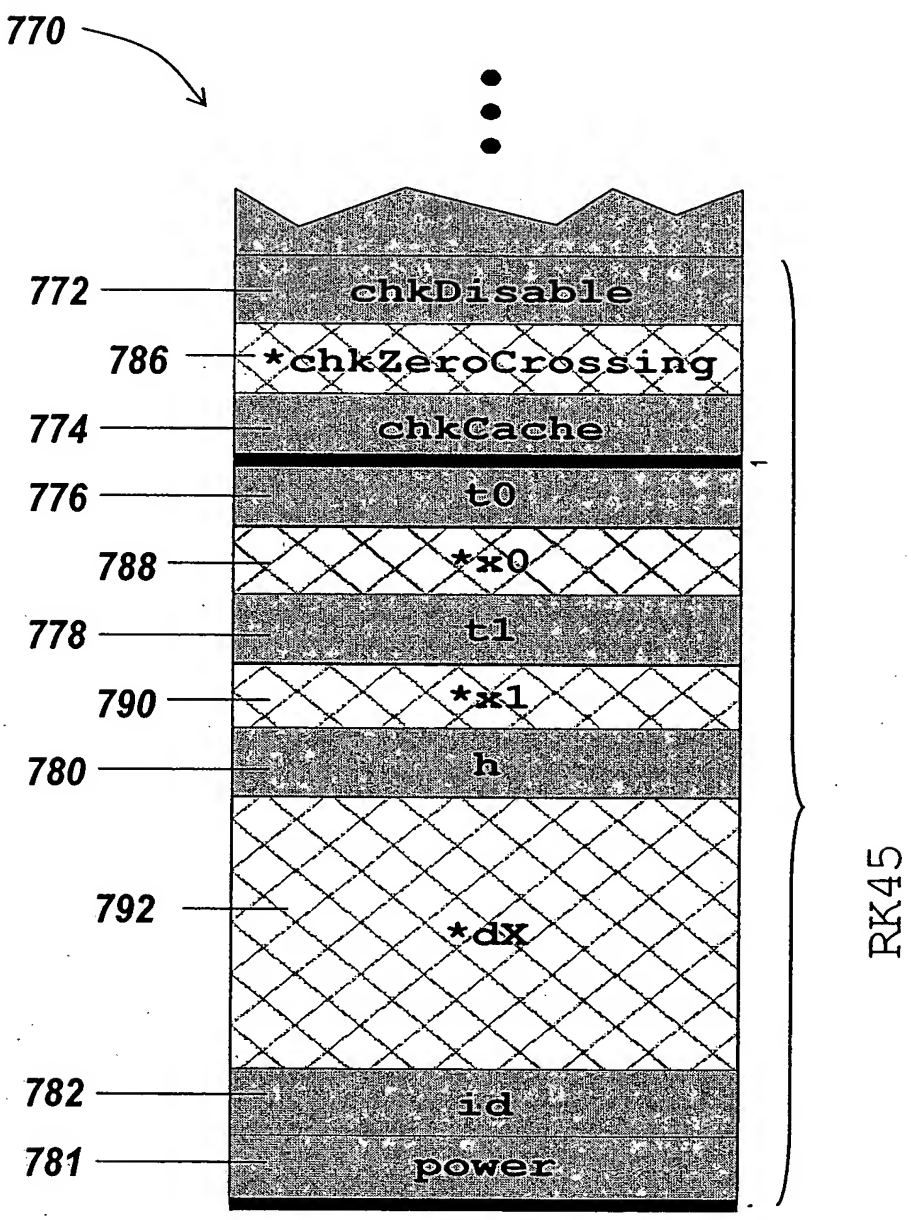
770
772
chkDisable
786
*chkZeroCrossing
774
chkCache
776
t0
788
*x0
778
t1
790
*x1
780
h
792
*dx
782
id
781
power
1
RK45

Fig. 7

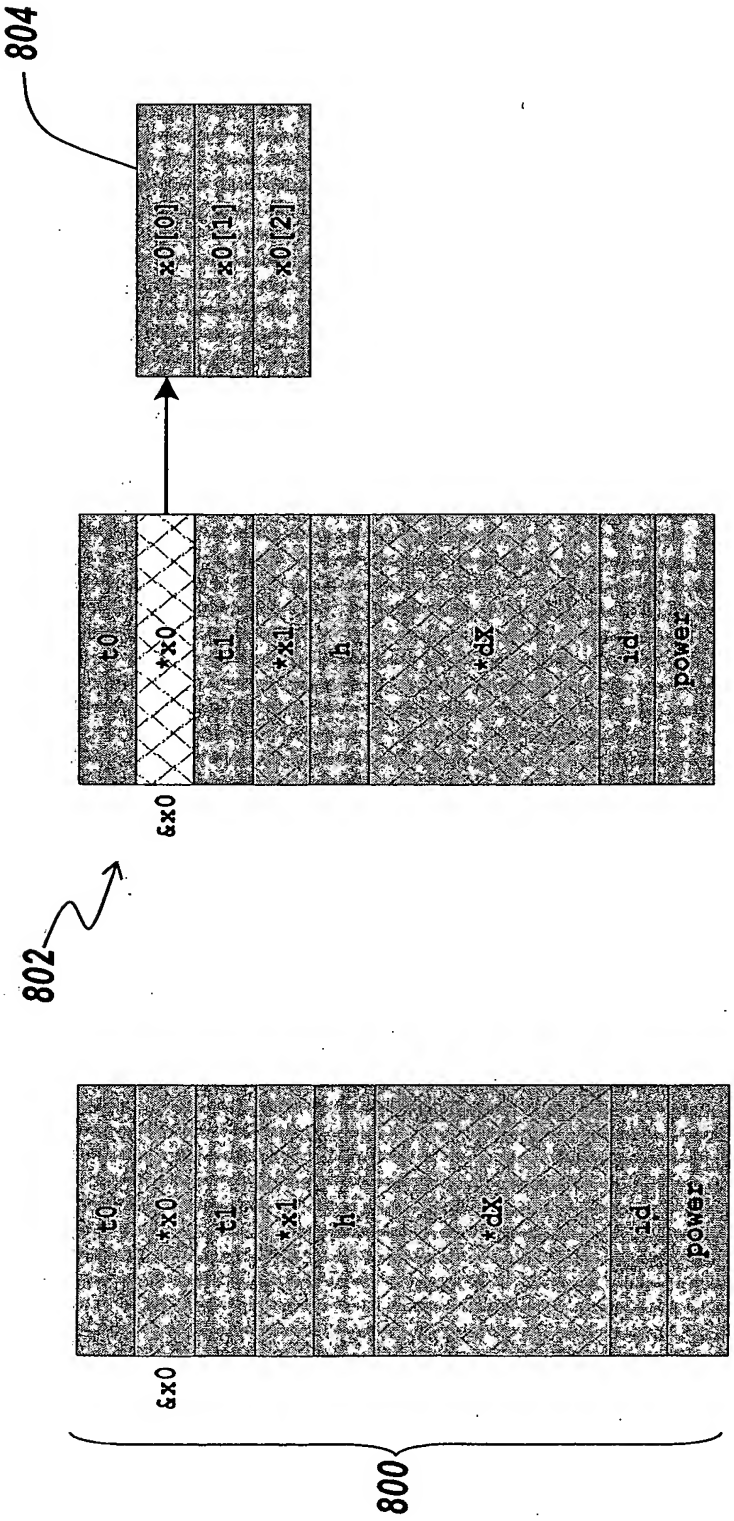
804
x0[0]
x0[1]
x0[2]
t0
*x0
t1
*x1
h
*dx
td
power
&x0
802
t0
*x0
t1
*x1
h
*dx
td
power
&x0
800

Fig. 8B

Fig. 8A

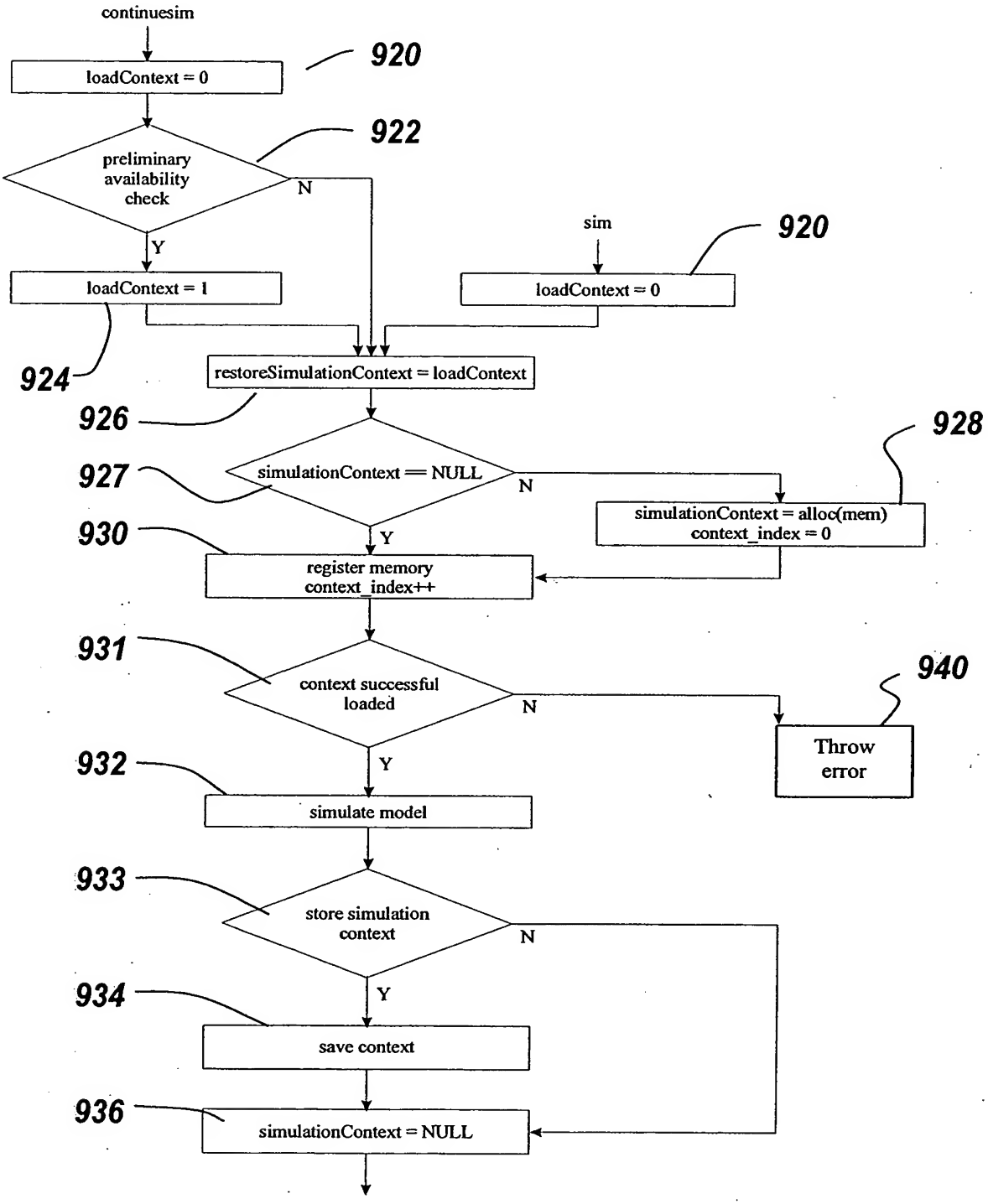
continuesim
loadContext = 0
920
preliminary availability check
922
N
Y
loadContext = 1
sim
loadContext = 0
920
924
restoreSimulationContext = loadContext
926
928
927
simulationContext == NULL
N
simulationContext = alloc(mem)
context_index = 0
930
Y
register memory
context_index++
931
context successful loaded
940
N
Throw error
932
Y
simulate model
933
store simulation context
N
934
Y
save context
936
simulationContext = NULL

Fig. 9